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ABSTRACT

The insects discussed in this document are those which have a direct effect upon humans either through a permanent association, as with lice, or a temporary association in the case of flies, bees. wasps, and spiders. In each case, life cycles and identifying characteristics are presented with remarks about the specific effect incurred by man. (CS)

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Insects Affecting Man

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INSECTS AFFECTING MAN

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TABLE OF CONTENTS

		Page No.
A.	INTRODUCTION	III-(G)-1
B.	BASIC RELATIONSHIPS	III-(G)-1
C.	PERMANENT ASSOCIATES	III-(G)-1
	1. Lice	III-(G)-1
	a. Head Louse	III-(G)-1
	b. Human Body Louse	III-(G)-2
	c. Pubic Louse	III-(G)-3
D.	TEMPORARY ASSOCIATES	III-(G)-3
	1. Fleas	III-(G)-3
	2. Bed Bug	III-(G)-4
	3. Kissing Bug	III-(G)-5
	4. Blood Sucking ("Biting") Flies	III-(G)-5
	a. Mosquitoes	III-(G)-6
	b. Black Flies	III-(G)-7
	c. Punkies ("No-See-Ums")	III-(G)-7
	d. Horse Fly	III-(G)-8
	e. Deer Flies	III-(G)-9
	f. Stable Fly	III-(G)-9
	g. Horn Fly	III-(G)-10
	h. Snipe Fly	III-(G)-10
	5. Non-biting Flies	III-(G)-10
	a. House Fly	III-(G)-10
	b. Lesser House Fly	III-(G)-11
	c. Latrine Fly	III-(G)-12
	6. Myiasis	III-(G)-12
	a. Obligate myiasis	III-(G)-12
	b. Accidental myiasis	III-(G)-12
	7. Stinging Insects	III-(G)-13
	a. Paper Nest Wasps	III-(G)-13
	b. Yellow Jacket	III-(G)-14
	c. Bald Faced Hornet	III-(G)-14
	d. Mud Daubers	III-(G)-15
	e. Other Digger Wasps	III-(G)-15
	f. Honey Bee	III-(G)-15
	g. Bumble Bees	III-(G)-16
	h. Carpenter Bee	III-(G)-16
	i. Velvet Ants	III-(G)-16
	j. Ants	III-(G)-17
	8. Blister Beetles	III-(G)-17
	9. Other Arthropods	III-(G)-18
	a. Black Widow Spider	III-(G)-18
	b. Brown Recluse Spider	III-(G)-18
	c. Scorpions	III-(G)-19
	d. Ticks	III-(G)-20
	10. Stinging Caterpillars (and their hairs)	III-(G)-20

INSECTS AFFECTING MAN

A. Introduction

The insects included here are those which, in one way or another, have a direct effect upon or within the person of humans. Many of these utilize the blood of man as a primary source of food; others feed on humans in lieu of other vertebrate hosts which serve equally well. Other species do not suck blood but spread germs as they crawl about on people and their food and dishes; they also cause very severe annoyance to the person by their presence and activities. Many other forms attack man only in self defense; some bite (spiders, ants) while numerous others sting when disturbed.

B. Basic Relationships

Certain blood sucking ectoparasites of man are so closely adapted that they cannot live on another host. Other blood sucking types use man as a temporary host, visiting man's person only in response to the need for food. The remainder of the insect's time is spent resting, digesting the blood meal, and producing eggs. Some blood sucking insects prefer cattle, horses, and other vertebrates as a source of food but respond positively to man's occasional presence. Other insects do not feed on blood but are adapted to life with man or his domestic animals and, in passing back and forth between habitats, spread filth and disease to man. A final relationship pertains when man and various insects and related forms try to share the same niche in a given habitat; stinging and biting are the defense measures used against man's intrusion. Man, in turn, responds by application of chemical and other control measures; these are given in detail in Section XI, Insect Control Guide.

C. Permanent Associates

1. Lice

Three types of "human lice" are so well adapted to life with man that they normally are unable to survive on another host. Two of these are full-time residents on man's body; the other lives in man's clothing and is entirely dependent upon him for food, temperature, and humidity.

a. Head Louse

These insects mostly live on the head of the human host (particularly in the hair above the ears and on top of the head) but may on occasion become established in other densely hairy

areas of the body. These lice are basically gray colored but vary with hair color of the host, are 2-3 mm (1/12-1/8 inch) long, are slender, and have pointed heads and a claw-clamp on each leg. A louse attaches to the hair of the head with the leg clamps, and are most difficult to dislodge when attached firmly in this fashion. When hair is shed, the attached lice or eggs drop off with the hair. Loose hairs, with eggs or lice hanging on, can stick inside a hat or cap. This provides a good means of infesting another head when the hat or cap is borrowed or "tried on" in a store or school.

Each female produces 50-150 eggs, which are glued to the hair near the base. Young lice hatch in 5-10 days and develop rapidly; egg to adult may take only 3 weeks. Adults and all sizes of young live in the hair and on the scalp.

Infestations spread easily through exchange of head wear or combs and scarves. Populations begin to build up in late fall and early winter, particularly on persons whose habits are notably unsanitary. Increased spread among school children often occurs after Christmas, when new caps and hats are traded back and forth. Eggs and loose lice are passed on to new victims.

The lice suck blood or lymph from the scalp. Eggs glued to hairs a slight distance above the scalp seal off a small space, within which the population lives, feeds, and increases. Such a well developed egg layer is called "false scalp" and prevents removal of the lice. Severe irritation and subsequent infection of the scalp follow prolonged feeding by this protected population of lice.

b. Human Body Louse

The body louse, which also goes by several other common names, is a close relative of the head louse. The two can be forced (experimentally) to interchange habits and replace each other. The body louse *per se* inhabits the clothing of man in places where it binds tightly against the skin. Lice prefer to live in seams and folds of the clothing but in case of a heavy infestation will remain on the body of the host. They are spread mainly through contact with lousy persons or their clothing.

These lice are about the same size as the head louse but have a more consistently gray color. Each female produces about 300 eggs, deposited by choice on fibers in the seams of clothing. Garments worn indefinitely without cleaning become heavily infested with eggs and lice. Hatching occurs after 5-7 days. Young lice immediately begin sucking blood and mature about 2

weeks later (egg to adult = 3 weeks). Populations build rapidly, and as many as 10,000 eggs and another 10,000+ lice have been reported from one man's shirt.

High populations of body lice and heavy feeding cause severe blood loss, along with eventual hardening and pigmentation of the punctured skin (vagabond's disease). The lice also transmit the microorganisms causing typhus fever, murine typhus fever, trench fever, and relapsing fever.

c. Pubic Louse

This insect, also called the crab louse and the crotch cricket, can be recognized by its resemblance to a minute crab. It is only 2 mm or less in length and is almost as wide as long. The legs are long and extend outward from the body. They also have the clamping-claw adaptation for clinging to the hair of the host. The front of the head is more blunt than in either head or body lice. The body also is more distinctly warty and hairy. These lice are relatively stationary but, as the population increases, they spread to all hairy parts of the body (including eyebrows, mustaches, and beards). The most common means of spread is by direct physical contact. Eggs or lice attached to loose hairs may also be acquired from bedding, clothing, or (rarely) public toilet seats.

Females produce only about 50 or less eggs, which hatch in about 7 days, and the adult stage is reached in 2-2-1/2 weeks. Populations increase rapidly and apparently go unnoticed for months. Infested persons often become aware of the problem only after severe itching begins to occur over much of the hairy region of the body.

All stages suck blood or lymph and cause intense irritation followed by skin discoloration. Secondary infection may follow the incessant scratching. These lice have not been implicated in disease transmission.

D. Temporary Associates

1. Fleas

These insects are highly adapted to their parasitic way of life, chiefly on small mammals, such as dogs, cats, and rodents. They readily bite humans when hungry and thus can be involved in the transmission of numerous disease producing microorganisms from reservoirs in rodents or other animals. They do not ordinarily remain on the body of a human, as they do on their smaller hosts.

Fleas are very small insects, wingless, flattened from side to side, and are frequently very spiny. They have long legs which are held close against the body when the insect is on its normal host. The thin flat body and closely held legs allow the insect to slide quickly and easily through the hair or fur of the host. The strong legs are useful for jumping onto another host when the flea is loose on the ground or floor. The mouthparts are piercing-sucking and the bite is extremely irritating to many hosts, including man.

The most common flea problems of humans arises from infested cats and dogs. These animals may become so heavily infested that the fleas begin breeding in the animal's bedding, in the carpeting of the living room, in the grass and soil of the yard where the pet rests, and in garages, sheds, barns, or dog houses where the pet sleeps. They also develop in great numbers in virtually all rodent nests.

Eggs are produced by female fleas while they are on the host. The eggs drop from the host to the floor or ground, and the larvae hatch in 7-14 days. They are minute, yellowish white, worm-like, and feed on various organic debris in their habitat, including the feces of adult fleas. Larvae can mature in about 10 days when conditions are most favorable or may develop very slowly (6-7 months) when food is scarce or temperatures are low. The pupal period may last 1 week or several months, again depending on temperature. Egg to adult stages thus may require as little as 4-5 weeks, allowing rapid population increases. Adult fleas may live only 2 months but at other times have lived more than 2-1/2 years.

Flea bites are extremely irritating to most humans. The insects also transmit plague organisms among wild rodents and from these rodents to man during outbreaks.

2. Bed Bug

The bed bugs are blood sucking insects which have a flattened body, top to bottom, which enables them to crawl into very small cracks and crevices in bedroom furniture, under door and window facings, into lamps and light fixtures, under loose wall paper, in plaster, or under carpeting and rugs. The body is covered with long recumbent hair curving backward. Their color varies from dark brown to black when full of blood, to an almost transparent gray-white when starved. In keeping with many other Hemiptera, they have defensive scent glands which emit a foul smelling substance when the bug is disturbed.

Fortunately, all the bugs do not feed every night; the nymphs feed once between molts (average 5 times) and again as adults before egg laying. Each female produces 200-500 eggs, which hatch in about 10 days. The egg to adult period lasts from 6 weeks to 11 months

or more. Normally, fed bugs can survive about 10 months without another blood meal. With no food at all, an adult bug lives only about 6 weeks. After feeding, adult females hide in the various recesses, and after digesting the blood, they glue eggs to the bedding or to the substrate in other locations.

The bugs hide by day in the bedding or in the many other places available in a bedroom, and even hide inside the back binding of books kept in the bedroom. They come out at night and suck blood from the human occupants of the bed. They also become established in certain types of living roor chairs and sofas; they creep out and bite the backs of people sitting there. Many persons are completely unaware of the bites. Others may react with skin irritations or rashes. The scent given off when the bug is disturbed is often more annoying than the bite.

3. Kissing Bug

The habit of biting sleeping persons on the lips provides the name for this group of insects. Mature kissing bugs may be 1-1/2 inch long, have a slender, pointed head and a much wider body, and are usually black or brown. A short, stout beak curves down and back from the lower front of the head. They "bite" with long, needle-like stylets which are exserted from the tip of the beak. The top of the body is flattened, while the lower surface is curved, resembling the bottom of a boat.

These bugs ordinarily develop outdoors in the burrows or nests of various small rodents. Lack of food or expanding populations cause them to leave these nests and wander around foundations and crawl spaces. From here, they work their way into bedrooms, where they hide during the day and come out to feed at night.

Kissing bugs bite so easily that the sleeping person is totally unaware of their presence. Salivary fluid injected by the bug during feeding may cause severe reactions a few hours later. If the person is quite sensitive, tissues of the mouth and throat may swell so extensively that breathing becomes difficult. The bugs nearly always defecate immediately after feeding, and micro-organisms causing chagas disease (if present) are scratched (with the feces) into the bite wound or are carried on the fingers to eyes, nose, or mouth. The disease organisms occur naturally in reservoir animals in the southwest part of this country; a high proportion of the kissing bug population of that region is infected.

4. Blood Sucking ("Biting") Flies

The insects covered in this category are two-winged insects, order Diptera. The functional mouthparts are piercing-sucking, cutting-sponging, or ripping-sucking. The structure of the stylets varies

from long, fine and threadlike (mosquito) to stout, blade-like cutting tools (horse fly). Salivary fluids are injected by all types, causing excessive bleeding, itching, and in some cases local swelling.

a. Mosquitoes

Mosquitoes are well known insects which cause at least some annoyance to virtually all residents of this area. They are small to tiny flies ("gnats"), with six very fine piercing-sucking stylets (these work as one unit). Most are gray, striped, or brown. The body is slender, the legs long and threadlike, and the proboscis is long and slender. Scales cover the wing veins and various portions of the body. A characteristic hum is produced by the moving wings as the female comes in for a blood meal. Males do not bite.

Many of the mosquitoes common to this area (i.e., Aedes sp.) overwinter as eggs on the soil surface. Eggs are also deposited around the edges of impounded water, in swampy areas, and in smaller accumulations of water in cans, old tires, buckets, tree holes, and in seeps or springs. Other very important species overwinter as adult females in damp, protected places, such as caves, old mines, and cellars. Still others pass the winter in the adult stage, hidden away in houses and barns.

Overwintering eggs hatch in the spring upon being flooded with fresh water. Larvae ("wigglers") develop in this water, feeding upon detritus, organic matter, and minute animals or plants. Larval development requires 7 to 10 days at higher temperatures, but takes much longer when the water is colder. Larvae change to pupae ("tumblers") which also live in the water. Pupae do not feed but come to the surface where they hang suspended by the surface tension of the water. They breathe from the air above the water by breaking through the surface film with a pair of minute breathing "horns." Slight disturbance of the water sends them tumbling downward. Adults emerge from the pupae, usually after 2 or 3 days. Development from hatching to adult thus may take 10-14 days if conditions are ideal. Many of our common species produce only one generation per year. Even so, the various species together often produce such enormous populations that the adults are a serious problem to humans. Females are capable of flying miles from their breeding grounds and bite wherever they go.

The most common effects of mosquitoes on people are irritation and swelling from the bites and annoyance from their presence and persistence in trying to bite. Accidental inhalation of a mosquito will often cause severe allergenic reactions. Many persons apparently are sensitive to the chemicals secreted by the mosquito's salivary glands; prolonged exposure to bites may cause very severe reactions.

Mosquitoes also transmit the causative organisms of numerous diseases of man. Encephalitis (sleeping sickness) is a virus-caused disease which is transmitted by certain mosquitoes. In this area, western equine encephalitis occurs in horses and may spread to man when an area is flooded and the mosquito population subsequently explodes. Other diseases involving mosquito transmission are malaria, yellow fever, dengue, and filariasis.

b. Black flies.

These tiny (1/6 inch long) insects are also called buffalo gnats and black gnats. The thorax is rounded or humped and the head is attached down low on the front. Antennae are short and stout, wings are membranous and have only one or two veins on the front edge; legs are long; and the body is stout. The adults usually are black but some species are brown or gray.

Females produce 400-500 eggs each. Eggs are placed at water surface level on emergent plants, logs, limbs, or rocks that stick up out of the water, and on rocks with water-splashed surfaces. The fly often goes under water briefly while she places the egg on its support. Eggs hatch in 4-30 days, depending on water temperature, and they breed in many types of water, from icy mountain streams to sluggish meadow brooks. Larvae attach to their support by way of an anal sucker, at times aided by a silk thread. Submerged logs or rocks in a swift, high altitude stream may have thousands of larvae. Larvae are very small, usually grayish to black, and have a swollen anterior region; their food is minute aquatic life. Development of the larvae requires 8-10 weeks in colder streams. Pupation occurs in the water; this stage may take only 5-6 days or up to 4 weeks.

This fly is a most vicious biter for its size. The mouthparts are minute blades which pierce the skin. A potent venom in the salivary fluid causes bleeding, irritation, localized swelling, and more severe symptoms on occasion. The hungry flies attack any exposed skin on the hands, neck, ears, nose, face, wrists, ankles, and eyes. The adults transmit disease producing organisms to man in other parts of the world; in this country they may transmit certain diseases of poultry.

c. Punkies ("no-see-ums").

These minute biting flies are also called sand flies, black gnats, or ceratopogonids (for family Ceratopogonidae). They are 1/50 inch to 1/5 inch long; the smallest species are so tiny that they are difficult to see at first. Their presence is indicated, however, by a very painful, stabbing pain in exposed skin on hands, face, ears, around the eyes, and in the edges of the hair. The thorax (if visible) is humped, the head is relatively large, antennae are large, body is slender, and the wings are laid flat over the abdomen.

Eggs are laid along the edges of small streams, in swampy areas, in moist earth, and in moist tree holes. Locally they appear to occur most frequently along rivers and trout streams, although their distribution in other habitats has not been studied. Larvae develop in water, mud or muck, or rich moist soil, and in other parts of the country they grow in salt marshes, clay soils, or plant debris and mud around ponds and slow moving streams. Larval growth is slow in many species, so that only one generation develops per year; some species have a 2-year cycle.

The bites of these minute flies are exceedingly painful to many persons. The bite may be followed by swelling, prolonged itching, and blisters which soon change to persistent open lesions. Secondary infection is always a danger because of the necessity for scratching. They apparently do not transmit pathogenic microorganisms to man in this country.

d. Horse fly

The horse fly is also called the green eye, the gadfly, and breeze fly. They are mostly stout-bodied flies, 3/4 inch to 1¼ inch long, usually brown or black, with large heads and enormous compound eyes. The wings are held flat over the abdomen, typically in a position with the rather pointed ends held at about a 30° angle away from the abdomen. The tip of the abdomen usually is visible between the partially separated wing tips. The wings are membranous and may be either transparent (colorless) or pigmented black or brown. The wing veins have a characteristic pattern.

Eggs (100-1,000) are laid in masses attached to leaves, stems, fence posts, branches of trees, or the upper inside surfaces of culverts or bridges. The larvae hatch and drop into the water, swampy areas, or moist soil beneath the oviposition site. Many larvae are predacious. Some species develop rapidly, but most are relatively slow. In many cases, partially grown larvae overwinter. When the larvae are ready to pupate, they leave the water or other wet habitat and move to a drier site. Here they form a cell in the earth, about 1 inch below the surface, and later change to the pupal stage within the cell. Adults emerge from the pupal cuticle and work their way up through the soil. Average egg to adult development was 97 days in warmer areas. One generation per year is apparently all we have in this area.

Horse flies bite with broad, blade-like stylets. These slice the skin or hide and an anticoagulant salivary fluid is injected into the wound. Prolonged bleeding, persisting long after the fly has fed and departed, often occurs. The flies will attack almost anything alive and/or moving. They have been known to strike moving vehicles and experimental models. The bites are very painful to man; however, the buzzing of the

wings usually alerts the human to the attack of the fly and they may be driven off without biting. Even though the fly may not succeed in biting, the annoyance level is very high. These flies may transmit anthrax and tularemia to humans; other pathogens are transmitted in other parts of the world.

e. Deer flies

The deer flies are very close relatives of the horse flies but are smaller (about ½ inch or less) and often have color patterns in the wings. Deer flies approach more quietly and the unsuspecting victim suddenly feels a needle-like stabbing pain, often on the back of the neck or in the edge of the hair. The flies are very persistent, returning over and over in an attempt to feed.

The biology and habitats occupied are similar to those of the horse flies. They are restless feeders, also, frequently moving from one host to another. The bites are very painful and also may involve disease transmission.

f. Stable fly

This small gray fly is often mistaken for the house fly and the victim then accuses the house fly of biting "just before a storm", but the villian is the stable fly. This insect is about ¼ inch long, is more robust than the house fly, and has mouthparts in the form of a needle-sharp proboscis (ripping-sucking) which projects forward from under the head. The two outside stripes on the thorax are broken and the abdomen has a checkered or spotted pattern. The fly rests on a flat surface with the head end tilted up and the back sloped downward. The wings at rest are spread apart at the tips; in bright light the wings also have an irridescent shine.

This fly probably overwinters in this area in the maggot stage deep in straw piles or in piles of manure mixed with straw. The maggots change to the pupal stage inside a leathery brown oval case (puparium) in the spring. Adults push their way out of the straw or manure-straw mixture in about 10 days to 2 weeks. Females require several blood meals for egg production and males also suck blood. When about 2 weeks old, the females begin oviposition, producing 500-600 eggs each, in 5 or 6 batches. Eggs hatch in about 3 days and larvae take 2-4 weeks to grow to adults. The pupa stage requires 1-3 weeks and the egg to adult period thus may be 21-60 or more days, depending on temperature. If the larvae overwinter, then that stage is greatly prolonged.

Adults of this fly are vicious biters of humans, especially just before a storm. The flies approach quietly and the first indication of their presence is a sharp, stinging pain. They frequently attack the back of the neck, hands, ankles, or other exposed skin. They can and frequently do bite directly through

a shirt or other summer clothing. They build up into large populations where the breeding sites are good, and cause the people in the area (usually a rural setting) no end of pain and annoyance.

g. Horn fly

This insect is about half the size of the stable fly and it also has a needle-like proboscis projecting forward from underneath the head. The fly has light stripes on the thorax and a single dark stripe down the middle of the abdomen. It is primarily a pest of cattle but can be highly aggravating to people working with or living near cattle.

The horn fly overwinters as the larva in cattle droppings. The larvae develop rapidly, pupate inside a small puparium, and the adult flies emerge about 1 week later. New adult females lay eggs on fresh cattle manure and a new generation of flies can appear in about 2 weeks.

The adults are blood feeders but have not been implicated in disease transmission to man.

h. Snipe fly

This is another fly which lands very quietly on the back of the neck or other exposed skin and inflicts a very painful bite. The species most likely to bite men in this area is about 1/3 inch long, has a black body and reddish legs. The feet have three pads under the claws (use hand lens) instead of the two on a house fly or stable fly. The wings have noticeably more veins than do those of the other two.

The snipe flies can be a very severe problem when present in large numbers.

5. Non-biting flies

The flies in this group have a sponging pad on the end of a folding proboscis. They suck up liquids for food and are said to have sponging-sucking mouthparts.

a. House fly

The house fly probably makes up 97-98% of the flies which gather inside or around the outside of the dwelling places of man. Although they do not bite, they habitually crawl over people (especially when sleeping), and human food, dishes, pots and pans, and practically every surface inside. While outside, they frequent garbage, sewage, animal droppings, human wastes, and any other decomposing organic matter available. Their feet and legs, mouthparts, and digestive tract are ideally constructed to gather microorganisms, which later are left behind as the

fly walks around inside the home. The pathogens (or intermediate stages) of some 35-40 diseases are known to be transmitted by the house fly.

The adult house fly is about 1/4 inch long, generally slender to medium in body, with distinct black stripes on the thorax and one such stripe on the yellowish abdomen. The mouthparts are a soft, folding proboscis with a wide, soft, grooved sponging pad at the end. The grooves collect liquids and bring them to a central point at the end of the proboscis and a sucking apparatus then takes the fluids into the digestive tract. If a substance tastes good but is not in liquid form, the fly regurgitates a drop of fluid from its digestive system onto the food substance (i.e., dry sugar), dissolves part of the substance, and then sucks most of the solution up again. Some of the fluid soaks into the food substance, along with any microorgansism which may have been present. Thus, infection may begin or be spread. Individual house flies have been found carrying over 6 million bacteria.

Females place eggs (500-600 total) in animal manure, garbage, decomposing plant matter, animal droppings, and many other moist types of organic matter. Development is rapid; mature larvae leave the growing place and crawl away to a drier site for pupation. Mass migration of larvae from garbage cans have often been observed, providing the first indication of a fly problem. Pupation takes place inside a leathery tough brown case. When adult, the fly pushes one end off the case and crawls out to expand and dry its wings. New adult females are ready to oviposit in from 3 days to 3 weeks. Total life cycle time (egg to egg) can be as little as 10 days, or it may stretch out to 6 weeks. The house fly apparently overwinters here as larvae or pupae.

The house fly cannot bite a person but is a most persistent pest in crawling over people and their possessions and foods. They are a public health menace because of their disease transmission abilities.

b. Lesser house fly

This fly is slightly smaller than the house fly but resembles it in color. The indoor flight habits are quite different from those of the house fly: the lesser house fly often hovers, in the middle of one room or another, without moving on or landing on a table or person. The female fly places eggs on decaying plant material or excrement, preferably that of humans, horses or cattle. The larvae are short, stout, and spinose. Development is rather quick. Adults traveling between oviposition sites and the interior of the home could very possibly be carrying pathogens.

c. Latrine fly

This fly is very similar to the lesser house fly but may be slightly larger and may also be darker bluish to black. Eggs are placed in the same places and development (egg to adult) about the same, at about 18-21 days. The habits and possibilities for spreading disease are similar to those of the lesser house fly.

6. Myiasis

This "disease" of man is caused by the invasion of organs or tissues of humans by fly larvae. Most often the larval forms involved are the maggots of blow flies, house flies, flesh flies, screwworm flies, lesser house fly, or "bottle flies"; the larvae of bot flies and warble flies also attack man.

a. Obligate myiasis

Obligate myiasis of man occurs when the human bot fly attacks people. This is found mainly in the South and Mexico. Eggs are deposited on the skin by the female fly or they may be carried to the human by a hungry female mosquito. Larvae bore into the skin soon after hatching, and settle down to feeding in one location. Full grown larvae cause lesions in the skin; they leave through an opening and drop to the ground to complete the life cycle.

b. Accidental myiasis

This is a general term which includes all the other fly larvae which invade humans. Certain species are obligate parasites of horses, cattle, sheep, or rodents but on rare occasions have been known to attack man. Most cases of maggot myiasis in man are attributable to species which ordinarily develop in some form of decaying organic matter.

Myiasis of the digestive tract most often follows the ingestion of eggs or very young maggots in or on raw, partially decomposed fruits and vegetables, or when infected soil is carried to the mouth or nose by dirty fingers. (Eyes may also be infected with fly larvae carried there by dirty hands). The maggots develop in various locations in the stomach or intestine. When mature, the larvae move down and are voided.

Persons sleeping outdoors or in other locations where exposed to adult female flies are subject to myiasis of the ears, nasal passages, mouth, or urinary system. When these body openings are exposed and are infected or grossly unclean, they attract adult female flies for ovipostion. Eggs or living maggots are deposited in any of the openings. Larvae work their way inside as soon as they hatch (or are deposited alive); severe pain and

other symptoms follow. The larvae also tend to leave the feeding site and drop to the ground for pupation. Maggots of house fly, blow fly, flesh fly, and screwworm fly are most often involved.

Cutaneous myiasis occurs most often when a wound or infection is untreated and the discharge attracts the female fly. The screwworm fly maggot is the most common invader in this category. Eggs are deposited directly into the wound or sore by the fly. Eggs hatch quickly and the young maggots feed within the infected area. As the maggots grow and the supply of decomposing tissue is cleaned up, the maggots burrow outward into uninfected tissue and continue feeding. The larvae leave the wound and drop to the ground for pupation if they are still in the vicinity of the original opening. If they have migrated away from the opening, however, their response to gravity may take them downward under the skin. Such a case of screwworm infection of the scalp was reported in the South. The mature larvae worked their way downward under the scalp, along the sides of the head, with more than 100 maggots ending up in the ear lobes. This elicited medical attention which solved the problem. Blow fly and flesh fly maggots might also be involved.

Creeping dermal myiasis is usually due to larvae of bots or warbles moving about under the skin. The eggs are deposited on exposed human skin and the newly hatched larvae burrow inside without being felt. In time their increased size and activity cause lumpy swellings under the skin. These migrate about over the surface of the body, now accompanied by pain and intense irritation. At maturity, the larvae settle down, cause a boil-like swelling, and eventually emerge through the central opening, to drop to the ground for pupation.

7. Stinging insects

A number of deaths of humans have been attributed, in recent years, to the stings of wasps or bees. Such violent and sometimes fatal reactions to insect venom probably occur as a result of hyperallergenic shock. Most people can recover from a bee or wasp sting with only temporary damage and may even profit from the encounter by developing immunity. Others apparently cannot develop a tolerance for the venom and in some cases may become more sensitized with each sting. The following types of insect are involved in this problem: Wasps (paper nest, yellow jacket, hornet, diggers); bees (honey bee, bumble bee, others); ants. These hymenopterans have no visible stinger; as a general rule, those wasps which have a visible, sometimes very long, ovipositor are parasites of other insects and will not sting humans.

a. Paper nest wasps

These insects, also called Polistes wasps, are quick and violent with their sting response to any disturbance. They build one

layer nests out of paper they make from chewed up wood. Nests are suspended from tree branches in the woods but are also placed in sheltered sites under porches, eaves, door frames, window frames, and in garages, sheds, and barns. Each nest has a few (10-12) to 100 or more inverted cells, increasing as the summer progresses. Cells contain eggs, larvae, or pupae. Newly emerged adults stay with the nest, mostly as workers, and spend their time on the lower surface of the cells. Some fly out periodically to catch soft bodied insects for food but many always remain with the nest. These readily leave the nest and aggressively attack any apparent intruder.

These wasps attack moving enemies and seldom go to a motionless object on the ground. Thus if a person sees an attack coming, he can often escape by dropping flat on the ground and remaining perfectly still. A slow and careful retreat, with an eye on the nest, can be carried out after the wasps have returned to the nest and settled down.

Most of the paper nest wasps are reddish brown with small darker markings on the abdomen; wings are clear to smoky gray or brown and are folded longitudinally when at rest. They have a short "waist" between thorax and abdomen. Most of the individuals of any given nesting population are female workers and can sting; a few males usually are present and are stingless. The fertile females ("queens") overwinter in sheltered locations.

b. Yellow jacket

This ill-tempered species of stinging wasp is stout bodied, hairy, yellow with brown or black markings; the wings are also folded lengthwise at rest. It usually nests in a hole in the ground but may occupy a hollow branch or tree trunk or a space in an attic or wall. The nest within any such space is made up of several tiers of paper cells, made also from chewed wood pulp. Nesting sites are utilized year after year and the size may increase so that tremendous numbers of workers develop each year. Eggs, larvae, and pupae are housed in the cells of each tier. Workers leave the nest to capture food. This frequently is collected from infestations of webworms or other larvae on trees or shrubs. Because of this, the yellow jacket is at times classed as beneficial. The foraging workers also frequent picnic and camp sites, apparently attracted by sweets or fruit juices, but they usually do not sting readily when collecting food from a picnic table. Around the nest, however, they react violently, often attacking an intruder in large numbers.

c. Bald faced hornet

The "hornet" is a larger, more robust wasp. It is essentially black with a few yellow markings on the head, thorax, and end

of the abdomen. The wings are folded lengthwise when not in use.

The nest of this wasp is the well-known paper oval, suspended from a branch of a tree or shrub. An entrance hole in the bottom leads to one or several tiers of paper-nest cells inside; the size of the nest and number of tiers inside vary with the population. Some hornet nests are 12-15 inches tall and contain 6 or more tiers of cells. Such a nest may contain several hundred workers (sterile females).

Eggs are placed singly in the cells; larvae develop, one to a cell, as they are fed chewed insect larvae by the workers. Pupation occurs in the same cell. A few non-stinging males are usually present. Only the fertile females (queens) overwinter, usually in some sheltered location quite distant from the nest.

d. Mud daubers

These wasps are the architects of a variety of mud nests in the attic of houses or barns, in sheds, under eaves, on porch ceilings, and under bridges and culverts. Nests may be multiple-layered tubes or a variety of single-cell mud masses. This type of wasp has a very long, slender waist; a small rounded abdomen; and a larger thorax with long, spiny legs. The mud for nest building is scraped up and carried to the site by the legs.

Nest cells are stocked with paralyzed spiders or insects. An egg (or eggs) is laid on the food supply and the cell is sealed. The larvae feed upon the food provided and undergo complete development inside the cell. Each new adult female leaves the nest and begins a new colony elsewhere.

These wasps seldom sting unless severely crowded.

e. Other digger wasps

Here are included a number of wasps which dig holes in the ground, in pithy stems, or in partially decayed stumps and logs. The nest cavity is provisioned with paralyzed spiders, grasshoppers, leafhoppers, cicadas, and other forms. An egg or two is deposited in each cell; the cell is sealed, and development of the larvae proceeds inside. New adults leave to start a new nest in another place.

f. Honey bee

This insect, also called the hive bee, is the most common problem of man when bee stings are involved. This is a domesticated insect whose captivity is tenuous unless proper care is exercised by the beekeeper. Honey bee populations increase

during summer when hives become crowded and new queens are ready, swarms of bees leave the hives and settle in new quarters. Problems arise when the swarms settle in wall or attic spaces of homes or other buildings or in trees and shrubs near an entrance. Disturbance of these nests or interruption of the flight pattern of worker bees may bring out individuals ready to attack any moving object. Persons in bee yards may also be stung.

A beekeeper, if available, should be notified of the arrival of a new swarm of honey bees; he may want to capture the swarm and return it to his bee yard.

g. Bumble bees

These are large, more hairy bees which occasionally nest in a discarded article near a house or other building. These robust, often brightly colored insects generally do not sting people unless the nest is being threatened. The venom of such large bees could cause serious problems to a previously sensitized person.

h. Carpenter bee

Carpenter bees will chew nesting holes in unfinished structural wood in cabins, sheds, barns, and houses. These bees are usually large, robust, blue-black types with bare, shining patches on the abdomen. Their nesting excavations weaken supporting timbers; they seldom sting unless given extreme provocation.

i. Velvet ants

These insects are also known as mutillid wasps, woolly ants, mule killers, and cow killers; the last two names reflect the power of their sting. The "stingers" are wingless female wasps which resemble ants structually and which run around over the surface of the ground in the same manner as do true ants. Males have wings and the same color patterns but do not sting. Both sexes are extremely hairy in some species, less so in others. They may be reddish orange, light brown, or banded black. They are highly active and have an extremely tough body covering; they can be walked upon in the open fields without apparent damage.

The stinger of this insect is exceptionally long for the size of the body. It is curved, needle sharp, and either dark brown or black. The venom is exceptionally powerful and produces blinding pain. Females of some species are 1 inch long, so that the over-sized stinger and large quantity of venom together provide a powerful sting. These insects are especially hazardous to children who have not learned to leave them alone, and to any barefoot person who happens to step on one. Accidentally sitting upon a velvet ant or placing a hand or knee upon one while working a flower bed or garden also brings sudden and very painful results.

j. Ants

The true ants include a large number of species which are equipped with a stinger and very effective poison glands. While these structures are mainly defensive mechanisms, many types of ants are always ready to attack. Some species are highly aggressive and attack a person in large numbers, and the fiery, burning pain from the stings can be serious.

The most dangerous types are the fire ant, a recent introduction into the South, and certain tropical species in Central and South America. The common harvester ant here always is a threat if a person is on or near the nest. Numerous smaller species are equally mean and agressive, but most are too small to be dangerous.

Ants nest in the soil, in hollow pithy stems, hollow or dead tree trunks or limbs, and in a variety of small niches around the home and yard. Many of these do not sting; however, many are capable of inflicting a painful bite. Even if they neither sting nor bite, their very presence creates extreme annoyance in most people. The mere presence of hordes of ants is enough to create near panic in persons who have a phobia against all things that creep and crawl.

8. Blister beetles

Mostly these insects are of secondary importance as direct pests of humans. Most blister beetles are elongated, with a tubular shaped body, a narrow "neck", and a wider head. Common forms may be brown striped, speckled gray, solid black, or bright iridescent green and blue. These beetles in the larval state are normally predacious on grasshopper eggs and other forms of insect life in the field. Adult beetles increase to form great swarms during successive dry summer seasons. The swarms travel during the dry, hot part of summer, frequently invading home gardens and flower beds. They can strip a garden over night.

Blister beetles neither bite nor sting, instead, as the common name indicates, they cause sometimes huge watery blisters to rise on the skin. Such blisters are due to a chemical irritant in the blood of the beetle, liberated and rubbed into the skin (especially on the back of the neck) when the insect is detected and crushed in place; this is the normal reaction when something is felt walking around on the skin. When held alive, drops of an amber or colorless liquid are seen forming at the joints of the legs. Each small drop would cause a blister, if allowed to spread onto human skin. When a live beetle is disturbed and walks across the skin of an arm or leg, a double row of small blisters forms in its wake. People working in infested alfalfa or potato fields, home gardens, and children playing where the beetles are swarming are highly susceptible to attack.

The blisters caused by these beetles rise high and are filled with a watery fluid which can cause more blisters, and are very slow to heal.

c. Other arthropods

The most common pest here is the spider. Spiders are present in the environment of many persons, commonly being found in the home, around the foundations outside, and in flower beds, fields, and woodlands. Most of these many types of spiders are harmless to man. They virtually never bite a person and would cause little or no reaction if they were forced to bite. An occasional common spider bite may cause a reaction in a more senstitive person; when this happens, it is strongly recommended that the spider concerned be captured and submitted for further identification.

Two poisonous spiders occur in this country; these are the black widow spider and the brown recluse (fiddle back) spider. Our tarantulas, although blessed with a very bad reputation (due to size?) are harmless; some species in the tropics are quite poisonous.

a. Black widow spider

This species of spider does occur rather widely in Wyoming. The name is derived from the habit the female has of devouring the male after mating. Consequently, mostly adult females are observed. Young females are the next most common individuals.

Adult females are usually shining coal black but may be brown or gray. The abdomen usually is noticeably large and rounded, with the thorax region much smaller. Legs are long and slender and the same color as the body. A ruby red hourglass figure is present on the lower surface of the abdomen. An immature spider may have one or more red dots (same color as hourglass) on the midline of the upper abdominal surface, on the posterior slope near the apex. These spiders hide under loose boards, discarded paper, old boxes and barrels, under steps, beneath the seat in outdoor toilets, and in rodent holes on rangeland. They spin a loosely organized web in their hiding places. When the web is disturbed, they charge out of the retreat to grab for the food -- or to bite the intruding human anatomy.

A severe bite causes systemic as well as localized effects; one such result of a severe bite is slow paralysis of the abdominal and breathing muscles. Other severe symptoms will also appear. A physician should be consulted; the specimen should be collected and taken along for positive identification.

b. Brown recluse spider

This spider is not currently established in Wyoming but is a likely possibility for the future. Its bite is extremely poisonous and we should be constantly on the alert for its appearance.

The spider is a year-round inhabitant of dry basements, garages, sheds, and ground floor levels of homes in its present geographic range. It may also be found under various types of cover outdoors during the warmer seasons. It is readily adaptable and may change its habits when it reaches this area.

The spider has a medium sized body but appears larger because of the long, slender legs. The abdomen is about the size of a large pea and may be creamy white, tan, or brown; the upper surface usually has fine, curving lines of dark hairs. The thorax is smaller, flat on top between the legs, and has a violin-shaped dark mark in the center; the handle of the "violin" is pointed forward.

Small amounts of webbing are spun in the more remote hiding places; dark closets, behind furnaces, under hot water heaters, under book shelves, and under beds, loosely stacked boxes, and accumulations of lumber, tools, or hoses. The egg sacs are left there, the young hatch and scatter to infest still more area. Spiders of various sizes forage for food at night in the dark. During these hunts they crawl up and over walls, furniture, drapes, clothing, and books or papers. Because of this nocturnal habit of the spider, persons should always turn on lights before making a move in an infested area. A spider may be anywhere and will bite when crowded.

Additional caution must be taken when handling any bundle of clothing, putting on shoes or coats, carrying fireplace wood, or lifting or moving any object which might provide cover for the spiders. Bites occur when the spider and the cover are picked up. Many bites have occurred in the lower surface of the arm and in the skin between the fingers as a result of picking a spider up and squeezing it.

The venom causes severe systemic reactions in the kidneys and elsewhere in the body. Full strength bites also cause a sharp pain at the site, followed by a long-continued decomposition of the flesh beneath and surrounding the bitten point. Human flesh apparently is unable to neutralize the active principle of the venom, so that dissolution of the flesh continues until the hole hits bone or reaches the other side, as on a finger. In the past, severe cases have been treated by removing all softened flesh, followed by skin graft to repair the often extensive open wound.

A physician should be consulted when such a bite is suspected. The specimen should be collected and submitted for positive identification.

c. Scorpions

True scorpions have a bulbous enlargement of the last abdominal segment. This segment contains poison glands which empty through

a curved, hooklike stinger on the end. The animal normally catches small insects or other prey in its pincers, bends the narrow post-abdomen forward, and stings the victim into submission. The sting is also used in self defense.

Scorpions have a flattened cephalothorax bearing the legs and pincers, the abdomen is broad at the base where it joins the cephalothorax but is narrowed into a post-abdomen from about the middle on back. Females give birth to living young, which ride about on top of the female's back for several days; they are eaten by the female if they fail to get on her back.

d. Ticks

These arthropods are also close relatives of spiders. Rocky Mountain Wood ticks are most likely to be encountered, but several other species also occur in this area.

Ticks normally inhabit various wild animals but drop off to deposit eggs or to digest a blood meal. The hungry adults of various ticks, and sometimes hundreds of young seed ticks, climb up whatever vegetation is at hand and wait for a host animal. If a human happens along, the tick grabs onto the clothing, and eventually finds its way underneath. There the tick settles down and inserts the barbed mouthparts deep into the flesh. The tick may remain there for days, sucking blood and filling the body (if a female). Eventually the engorged female drops off and hides on the ground for oviposition.

It is imperative that all persons inspect themselves thoroughly after a trip through a tick infested area. The presence of an embedded tick may go unnoticed for days. During such a period, enough venom and/or microorganisms may be transmitted into the host to cause severe complications. Ticks should be removed before they become embedded, if at all possible. Once embedded, they are extremely difficult to pull off. Application of an irritant to make the animal withdraw the mouthparts is the best approach. Attempts at forcible removal may result in tearing out a piece of flesh, or it may tear the tick in two, leaving the mouthparts and front part of the body embedded in the skin.

10. Stinging caterpillars (and their hairs)

A number of caterpillars (larvae of moths or butterflies) have poisonous hairs or spines on the body. Many large caterpillars have large branching spines scattered over the body. The tips are easily detached and penetrate the fingers when the insect is caught. The spine tips contain a poison which reacts locally where the tip penetrated the skin; reactions include immediate pain, whitening of the flesh, and numbness lasting a few hours to several days.

Other caterpillars have a dense covering of long, soft hairs on the entire body. These hairs detach easily if the larva is

handled. Also, at pupation, the hairs are shed and may be used in building a pupation chamber. Strong winds blow the loose hairs about, and even though separated from the insect's body, the hairs are still extremely irritating to the eyes, nose, throat, and skin of most individuals. Some areas of eastern forests are virtually unusable for recreational purposes because of this problem. They are not as common in the west.